WHITE PAPER

THE MODULAR DATA CENTER CONUNDRUM AND THE TRULY MODULAR™ SOLUTION

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If one were asked to describe the nature of data center offerings today they could easily paraphrase Shakespeare's description of a rose by stating that, "a data center by any other name would still be called modular". The plethora of competing product offerings that self-describe themselves as "modular" has led the industry to adopt a term so broad that it includes everything from fixed location buildings to offerings that would probably look most familiar to a longshoreman. Unfortunately, it is left up to the customer to decipher this confusing modular code to determine the application that best suits their needs. The purpose of this white paper is to aid new data center customers in cutting through the "fog of modularity" by identifying the strengths and weaknesses of the major modular offerings and to introduce the industry's only Truly Modular™ data center alternative.

Building Based Solutions

Just as the name implies, building based solutions are in fact, building based. As a result they are available wherever a provider has chosen to purchase or build a facility. Ranging in size from 1.1 to 18MW of power capacity the modular element of these solutions is delivered through their ability to incrementally build out their interior space. Under this methodology customers are typically able to expand in increments of 8-12,000 square feet within the facility.

The primary advantages of the building based approach are that customers are ready to move in, able to expand when they want to (as long as space remains in the facility) and that their lease rates should reflect the cost efficiencies their provider has realized by building out the facility at one time. An important point of differentiation, and potential weakness, between competing building based offerings is the use of a shared mechanical/electrical (MEP)

backplane versus individual backplanes for each expansion unit (commonly referred to as "Pods").

Shared backplane architectures enable additional pods to be "plugged into" the existing backplane of the facility a design flaw that introduces two potential problems for customers. The first issue involves the inability of newly attached pods to be fully commissioned or tested. Typically full level 5 commissioning involves verifying that all systems respond appropriately in the event of a backbone system failure. Obviously, this level of testing cannot be done in a shared environment since the entire backplane cannot be shut down due to the negative impact on all the other attached pods. The second problem with the shared environment is directly related to the testing issue as a backplane failure will take down all the customer data centers in a facility. This has led to some of the most significant "lights out" outages in the past several years.

Although shared backplane building based offerings introduce a larger element of uptime risk than their discrete backplane counterparts, both have common inherent weaknesses. The first, of course, is geographic flexibility. Since a 100,000 square foot building includes a lack of mobility among its characteristics, customers in areas outside of the markets containing these facilities must often make the less than optimal decision to locate their new data center far from their home locations.

Obtaining a dedicated facility is also problematic with building based solutions. Since providers use a common area model akin to the multi-tenant office market, customers commonly share

their data center site with one or more additional customers. Operating in this shared facility mode is often problematic resulting in the need to schedule loading dock usage, a lack of storage and staging space and a lack of dedicated office space. Under this structure, customers requiring a dedicated facility have two less than desirable choices:

1) Lease the entire site and pay for unused capacity until such time as they grow to the point that they have filled the facility

2) Incur the time and expenses necessary for a build to suit solution.

Containers

Speed and simplicity of implementation are the hallmarks of container-based data centers. As the name implies, container solutions are self-contained units offering approximately 800 square feet of space with each unit operating as a single data center. Originally conceived by leading server vendors such as Sun, Dell and HP as a surreptitious method for increasing their server sales, a number of other competitors have developed their own container and container-like solutions over the past few years.

Due to their ability to be quickly implemented container solutions are most effectively utilized to fulfill interim applications. For example, containers have been used to satisfy the rapidly changing geographic requirements of the military. Unfortunately, the strengths of container solutions that make them effective in interim applications work to their detriment in fulfilling larger, permanent data center requirements.

Since each container is a discrete unit with limited floor space, scaling up to meet larger requirements necessitates that multiple units be connected together. The end result is a data center floor that is made up of multiple non-ADA compliant, non-contiguous, non-hardened units that drastically limit customers' flexibility in configuring their computing hardware and associated applications. The physical limitations of this multi-unit approach also complicate activities like data center moves, adds and changes. The design of container solutions does not deviate substantially from their intermodal freight progenitors that were built to be loaded, and unloaded, in their entirety. Thus, container solutions are not optimized for the piecemeal movement of computing equipment that characterizes a data center environment.

Building Based Containers or Modules

Building based modules or containers are a hybrid solution developed in an attempt to address the shortcomings of the individual container solutions outlined above. These product offerings use a building architecture similar to shared backplane building based solutions and enable customers to expand their operations by plugging additional modules into the backplane. Although this scheme does maintain the speed of implementation benefits of container solutions, it also retains their limitations in the areas of rack layout flexibility, shared common areas and physical support as well. These shortcomings are further exacerbated by the geographic constraints dictated by the base building itself that make this solution untenable for many companies located outside of the site's location.

The Truly Modular™ Data Center Solution

"Modular—Composed of standardized units or sections for easy construction or flexible arrangement"—Random House American Dictionary

Compass Datacenters' Truly Modular solution (patent pending) eliminates the inherent limitations of competing modular alternatives, including the geographic dependency of building based offerings and the floor space inflexibility of containers. Through the use of four (4) standard building blocks, a Truly Modular data center solution delivers a concurrently maintainable, Tier III certified, LEED Gold compliant facility with 1.0-1.2 MW of power and 10,000 square feet of column-less raised floor within a hardened shell.

The Building Blocks

A Truly Modular solution (patent pending) is constructed from four (4) building blocks that work in concert to deliver everything from the site's MEP to its office space and loading dock. Each component has been developed to address the full breadth of issues that users of other modular alternatives have been required to deal with over time. The components of a Truly Modular data center are the:

- CompassPod™

- CompassPowerCenter™

- CompassStructure™

- CompassSupport™

The CompassPod is the basic building block of the Truly Modular architecture. Delivering 1.0-1.2MW of power, the CompassPod supports rack densities from 2kW to 20kW without

containment. The decision to eliminate columns from the module's 10,000 square feet of 36" raised floor was made to ensure that users would have the maximum degree of flexibility to accommodate a variety of potential rack configurations. This design element was also incorporated to offer a revenue stream for service providers or different business units by providing them with the ability to easily partition the space into private suites with dedicated entrances.

The CompassPowerCenter (patent pending) is factory built and shipped to the site on three trucks to support the 150-day delivery schedule for each Truly Modular solution. Each PowerCenter features a 2N power (PDU, UPS, switchgear) structure coupled with an N+1 mechanical design to meet the Uptime Institute's Tier III standards.

Each CompassPod works in concert with a CompassStructure. The design of the CompassStructure is the primary element that liberates a Truly Modular solution from any geographic boundaries. The module is compliant with both Miami-Dade County standards to resist winds of up to 149 mph, and a 1.5 seismic factor to enable a Truly Modular data center to be implemented wherever a customer has a requirement. Built in storage and staging space (pre-wired for the most common power outlets) is also included in each CompassStructure. This enables computing equipment to be stored and staged at locations adjacent to the data center floor rather than in a single area located within an entire facility.

The CompassSupport module provides all of the components necessary for data center operations including the loading dock, lobby, security center, restrooms, a secondary POP room and office space. The module has been designed to address common issues that regularly occur in other market offerings. For example, the movement of equipment from the loading dock in other solutions often involves travelling from a distant area of the facility while also negotiating multiple ramps or elevators. In the CompassSupport module the loading dock area has been designed to enable equipment to be efficiently unpacked and transported directly into a storage room. Another common issue addressed by the module is the need for multiple security personnel. The module's Fishbowl™ security capability enables a single security guard to view all loading dock, parking lot and office activities from a central location thereby reducing your OpEx.

Simplified Capacity Planning and Expansion

The ability to expand data center capacity is a universal customer requirement. As discussed earlier, expansion in container or building based environments often results in exacerbating existing limitations such as container floor space flexibility or rack density issues, or incurring the unnecessary expense of paying for unused capacity associated with building based applications. In a Truly Modular solution, simplifying the expansion process has been architected into the physical components. CompassConnect™ capability is built into each CompassPod and CompassStructure module to eliminate the need for risky in-building construction. Through the use of optional connecting service and personnel corridors customers can elect to expand, or not expand, based on their requirements at a given time. As

a result of this "expansion ready" design, capacity is added to a Truly Modular data center in 1.0-1.2kW, 10,000 square foot increments.

<u>Designed for Energy Efficiency</u>

A critical factor in operating a data center is the efficiency of its operations as reflected in its Power Utilization Effectiveness (PUE) rating. Within this paradigm, the level of efficiency is influenced by a variety of factors with the level of IT load (the percent of capacity in use) being the most influential variable. More succinctly, as the load within your data center increases your PUE rating improves.

By leveraging outside air economization and very large variable frequency drive fans, the Truly Modular data center solution uses a *Minimum Load, Maximum Performance Architecture*™ to deliver PUE levels of 1.5 or less independent of load (See Appendix A). This level of performance would normally require load levels approaching 90 to 100% utilization but are achieved in a Truly Modular environment at rates as low as 25%. Unlike other modular alternatives, this degree of performance enables a Truly Modular data center to operate more cost effectively and with a level of predictability that increases the accuracy of power budgeting and/or pricing.

Summary

 The ability for organizations to add data center capacity continues to be the catalyst for the growth of the modular data center market. However, the unexpected consequence of this demand has been the development of a variety of product offerings that advertise themselves as modular no matter how tenuous the relationship. For customers, this has meant having to

accept solutions that only partially addressed their requirements. Compass Datacenters Truly Modular solution has been developed to provide an alternative that overcomes the limitations of competing modular data center permutations. Its use of four basic building blocks to provide geographically independent, resilient and cost effective data center solutions provide clarity to the industry regarding its modular definition while offering businesses a comprehensive alternative to the partial solutions that have characterized the market to date.

About Compass Datacenters

Compass Datacenters' Truly Modular™ solution uses four standard modules to cost effectively deliver dedicated Tier III certified, LEED Gold data centers to businesses in the 98% of the country not covered by the data center industry. Through our innovative use of technology, and by leveraging our extensive data center experience, we have designed a solution that removes the unnecessary complexities associated with data center design, construction and operations to provide you with an alternative that is easy to plan, implement, operate and grow.